REMARKS

Claims 1-4 are pending in this application.

35 U.S.C. § 103 Rejections

Claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over United States Patent No. 3,975,267 to Wendel (hereinafter "Wendel") in view of United States Patent No. 5,393,416 to Kozak et al. (hereinafter "Kozak"), and further in view of United States Patent No. 6,340,712 to Kunin et al. (hereinafter "Kunin"). The Examiner suggests that it would have been obvious to rinse the resin of Wendel according to the teaching of Kozak, followed by regeneration with the ultra-pure water according to Kunin. Applicants respectfully request reconsideration.

The present invention is directed to a method of regenerating an ion exchange resin consisting of the steps of:

packing a used ion exchange resin in a regeneration tower; and

sequentially repeating, at least twice, a step that includes passing an aqueous solution of regenerant through the regeneration tower downward from a top part of the regeneration tower and thereafter passing ultra-pure water through the regeneration tower upward from a bottom of the regeneration tower.

Wendel discloses a method of producing treated liquids by using an ion exchange resin. The liquid to be treated is passed through a zone containing the ion exchange resin. When the ion treating resin is exhausted, it is regenerated by passing therethrough a liquid regeneration solution (in a direction opposite of the flow of liquid to be treated). The regeneration solution is added in increasingly

concentrated amounts in at least two steps and preferably three steps or more. Wendel also requires a pressurization step designed to reduce expansion and to provide full and complete contact of regeneration liquids with ion exchange resin materials.

Kozak discloses an automated system for providing at least periodic removal of metal ions from a chemical complex and contaminants from a chemical bath. The chemical bath is passed through an ion exchange resin column at a low velocity to prevent coagulation of latex particles.

Kunin discloses non-chloride containing regenerant compositions that include potassium acetate or potassium formate, at least one surfactant and at least one chelating agent, as well as methods for efficient regeneration of water softeners utilizing the regenerant compositions.

As the Examiner indicates, Wendel does not disclose or suggest using ultra-pure water to rinse the generated resin in an upward direction as is done in the present invention. In fact, the specific order of the steps in the present invention is not disclosed or suggested in Wendel.

Additionally, the pressurization step in Wendel is different from controlling the flow direction of regenerant solution and ultra-pure water. The expansion of the ion exchange resin is influenced by the composition and functional groups of the resin. The regeneration method of the present invention does not include a pressurization step as indicated in Wendel.

The Examiner argues that although claim 1 recites "a method of regenerating an ion exchange resin consisting of the steps of," the step of "sequentially repeating, at least twice, a step comprising passing an aqueous solution of regenerant through the regeneration tower..." can be augmented by an additional step, because of the "comprising" term within the step. Applicants contend that the Examiner has misread the meaning and intent of the claim.

The transitional phrase "consisting of" excludes any element, step, or ingredient not specified in the claim. MPEP § 2111.03 citing In re Gray, 53 F.2d 520, 11 USPQ 255 (CCPA 1931).

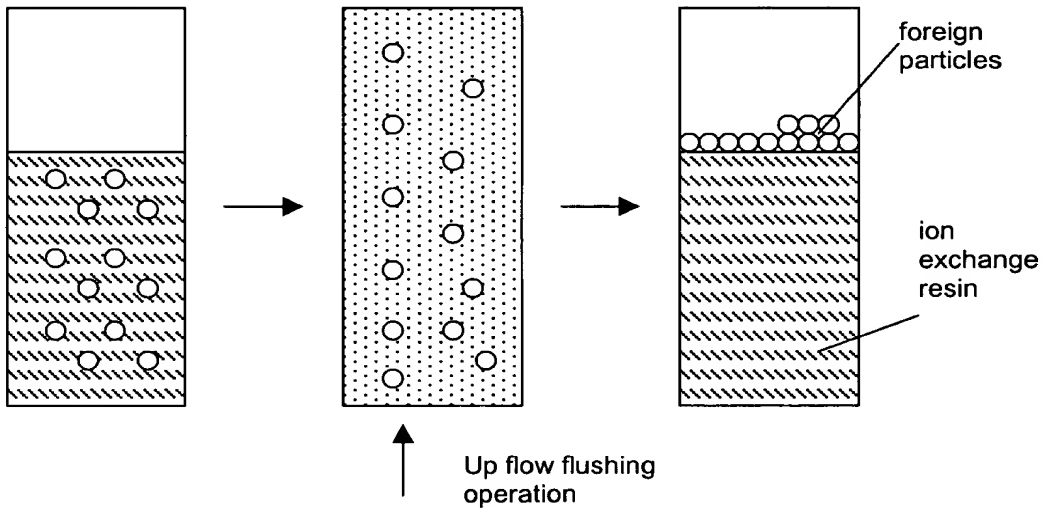
The Examiner attempts to explain away ignoring the "consisting of" limitation by stating that the pressurization step in Wendel might be part of a passing step to reduce resin expansion or it might be part of a packing step. Obviously, there is no clear way to explain the pressurization step other than to admit that it is a separate step that is precluded by the limiting "consisting of" language in claim 1. The pressurization step in Wendel is different from controlling the flow direction of regenerant solution and ultra-pure water. Further, the expansion of the ion exchange resin is influenced by the composition and functional groups of the resin, not pressure. The regeneration method of the present invention does not include a pressurization step as indicated in Wendel, and that required step places Wendel outside of the scope of the present claims.

The disclosure in Kozak recites the following at col. 17, lines 19-29:

> Mode VI-B is provided via controller 127 for rinsing IEX column 29 in an upflow direction 8 with DI

> water, and discharging the rinse water from the system for waste treatment. This upflow flushing operation is performed at a predetermined velocity for the flow of DI water to fluidize the ion exchange resin 30 in the IEX column 29, for substantially removing foreign particulate material from IEX column 29. In this manner, plugging of the IEX column 29 by the buildup of the foreign particulate material over a number of subsequent cycles of operation is prevented. (emphasis added)

In other words, the method disclosed in Kozak is carried out to separate or remove foreign particles from an ion exchange resin column based on the differences in their gravity or density.



The method disclosed in Kozak is different from the present method of regenerating an ion exchange resin. Kozak does not disclose or require that the ion-exchange resin be regenerated by a regenerant.

Kunin discloses that the resin bed is subsequently rinsed with 10 liters of ultra-pure water at 220 ml/min to displace residual calcium chloride.

Indeed, in Kunin, ultra-pure water is used to rinse the resin bed. However, Kunin does not disclose or in any way suggest the repeated downward application of an aqueous solution of regenerant solution and an upward application of ultra-pure water as in the present invention.

Kunin does not disclose what kind of flow of aqueous regenerant solution and ultra-pure water is applied.

By the specific operation of the present invention, if channeling occurs in a layer of ion exchange resin, the channeling is broken with the result that, without occurrence of non-uniform regeneration, the ion exchange resin can be regenerated efficiently and homogeneously. Further, the internal parts of the ion exchange resin can be washed. Additionally, in the present invention, the regeneration of the ion exchange resin is carried out through the use of an ion exchange resin tower (regeneration tower) different from purifier towers. Therefore, mixing of the regenerant into the purifier towers can be avoided, and it is not needed to interrupt the purification of aqueous hydrogen peroxide solution.

Channeling is a condition in which the resin allows a direct flow of water through the ion exchanger. Flow channels are established from the inlet to the outlet of the ion exchanger, which allows water to flow essentially unrestricted through the resin via these paths. If channeling occurs, the water flowing through the resin bed has insufficient contact with the resin beads and results in a decrease in effectiveness of the ion exchanger. Channeling most often results from improper filling of the ion exchanger with resin. If insufficient water is mixed with the resin

when it is added, the resin column may contain pockets, or voids. These voids may then set up flow paths for channeling to occur. Improper design or malfunction of the water inlet connection (flow diffuser) can also lead to channeling. (see http://www.infodotinc.com/doechem2/chem226.htm).

Wendel merely discloses the widely known process of regeneration of the exhausted ion exchange resin. Furthermore, Wendel discloses that it is known that spent ion exchange resin is generally regenerated by a regenerant. An anion exchange resin can be regenerated by packing the anion exchange resin in a tower and sequentially passing an alkali aqueous solution, an acid aqueous solution, and once more an alkali aqueous solution through the anion exchange resin tower. In other words, both alkali and acid are used as regenerant.

For resins regenerated by the method described above, a regenerant, such as NaOH or HCl, may remain in the ion exchange resin. This residual regenerant may act to prevent or retard the satisfactory removal of ionic impurities from an aqueous hydrogen peroxide solution. Further, in this conventional method, channels are formed ("channeling") through which much of the regenerant passes. Channeling leads to non-uniform contact between the regenerant and the ion exchange resin, which results in an ion exchange resin that is not homogeneously regenerated.

In the present invention, alkali materials such as NaOH and acid material such as HCl are not used as regenerants. Therefore, the potential for such materials to act as ionic impurities can be eliminated. By contrast, Wendel only

discloses the widely known process for regenerating exhausted ion exchange resins, and does not disclose the presently claimed process or in any way suggest the benefits of or provide motivation toward the present process.

The Examiner combines Wendel with Kozak, but the method of Kozak is carried out to separate or to remove foreign particles from an ion exchange resin column based on the differences in their respective weight or density. The method of Kozak is different from the regeneration of an ion exchange resin. Kozak does not show that an ion-exchange resin is regenerated by the regenerant. Therefore, Kozak does not provide the teaching of washing an ion exchange resin as required by the Examiner to modify Wendel to arrive at the present invention.

Kunin discloses a non-chloride containing regenerant composition and method for regenerating water softeners. In Kunin, ultra-pure water is used in rinsing the resin bed. However, Kunin never includes the repeated downward application of an aqueous solution of regenerant and that ultra-pure water is applied, or the flow rates of either the aqueous solution of regenerant or the ultra-pure water, as in the present invention. Since the Examiner has taken Kunin and Kozak out of context in applying them to Wendel, and they do not overcome the shortcomings in Wendel, a *prima facie* of obviousness has not been proved, as the combined prior art does not provide the teaching of washing an ion exchange resin as required to arrive at the present invention.

None of Wendel, Kozak and/or Kunin, taken alone or in combination, disclose, describe, teach or in any way motivate a skilled artisan to regenerate an

ion exchange resin using only the steps of packing a used ion exchange resin in a regeneration tower, and sequentially repeating, at least twice, a step that includes passing an aqueous solution of regenerant through the regeneration tower downward from a top part of the regeneration tower and thereafter passing ultra-pure water through the regeneration tower upward from a bottom of the regeneration tower.

Therefore, claims 1 and 2 are not rendered obvious over Wendel in view of Kozak and/or Kunin. Applicants respectfully request reconsideration and withdrawal of the rejection and allowance of claims 1 and 2.

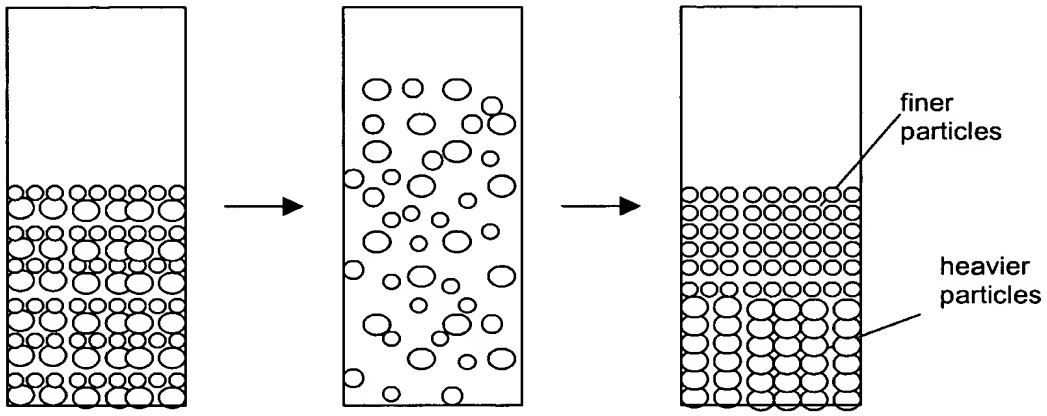
The Examiner has rejected claims 3 and 4 under 35 U.S.C. § 103(a) as being obvious over Wendel in view of Kozak and Kunin, and further in view of United States Patent No. 4,652,352 to Saieva (hereinafter "Saieva").

The above remarks regarding the combination of Wendel in view of Kozak and/or Kunin are incorporated herein.

Wendel, Kozak and Kunin are clearly distinguished above. Saieva discloses a process and apparatus for recovering metals from dilute solution. Saieva discloses a closed loop process and apparatus, whereby metals may be recovered from spent electroplating rinse solutions for reuse in the electroplating bath with essentially no generation of waste. However, Saieva does not disclose how to regenerate the spent ion exchange resin. Furthermore, twice repeating the step of passing an aqueous solution of regenerant through the regeneration tower downward from a top part of the regeneration tower and thereafter passing ultra-pure

water through the regeneration tower upward from the bottom of the regeneration tower is not disclosed in Saieva.

In the present invention, after the treating resin is exhausted, the resin is backwashed or pre-rinsed to cleanse the resin by mechanical action and to reclassify the resin particles by weight and size, the finer particles remaining in the upper part of the bed and the heavier particles at the bottom of the bed.



This treatment is conducted to eliminate particulate impurities due to differences in gravity or density. The treatment is conducted prior to regeneration of the ion exchange resin. The reclassification step is not part of the present regeneration method.

Claims 3 and 4 indicate that the regeneration tower can be made of a fluororesin, a vinyl chloride resin or a polyolefin resin.

However, adding the disclosure of Saieva to that of Wendel, Kozak and/or Kunin, taken alone or in any combination, does not bridge the gap to lead one skilled in the art to the present invention. The combined disclosure still fails to

describe, teach or in any way motivate a skilled artisan to regenerate an ion exchange resin using only the steps of packing a used ion exchange resin in a regeneration tower, and sequentially repeating, at least twice, a step that includes passing an aqueous solution of regenerant through the regeneration tower downward from a top part of the regeneration tower and thereafter passing ultra-pure water through the regeneration tower upward from a bottom of the regeneration tower.

In the present invention, even if channeling is generated in a layer of ion exchange resin, the channeling is broken with the result that, without the occurrence of non-uniform regeneration, the ion exchange resin can be regenerated efficiently and homogeneously. Further, the ion exchange resin can be washed within the tower. Still further, in the present invention, the regeneration of ion resin is carried out by the use of an ion exchange resin tower (regeneration tower) which is different from purifier towers. Therefore, the mixing of the regenerant in the purifier towers can be avoided, and it is not needed to interrupt the purification of aqueous hydrogen peroxide solution.

The combination of Wendel, Kozak, Kunin and Saieva does not render claims 3 and 4 obvious. Therefore, Applicants respectfully request reconsideration and that the rejection be withdrawn and that claims 3 and 4 be allowed.

CONCLUSION

In view of the foregoing remarks, it is believed that the present application is in condition for allowance. Reconsideration of the rejections and allowance of claims 1-4 are respectfully requested.

Respectfully submitted,

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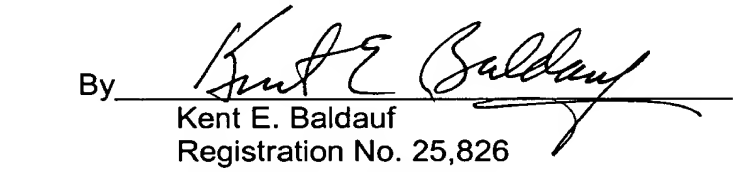
By 

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